

Planning and Conducting Surface Preparation and Coating Operations for Oil and Natural Gas Drilling and Production Facilities in a Marine Environment

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Upstream Segment

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FOREWORD

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Asbestos is specified or referenced for certain components of the equipment described in some API standards. It has been of extreme usefulness in minimizing fire hazards associated with petroleum processing. It has also been a universal sealing material, compatible with most refining fluid services.

Certain serious adverse health effects are associated with asbestos, among them the serious and often fatal diseases of lung cancer, asbestosis, and mesothelioma (a cancer of the chest and abdominal linings). The degree of exposure to asbestos varies with the product and the work practices involved.

Consult the most recent edition of the Occupational Safety and Health Administration (OSHA), U.S. Department of Labor, Occupational Safety and Health Standard for Asbestos, Tremolite, Anthophyllite, and Actinolite, 29 *Code of Federal Regulations* Section 1910.1001; the U.S. Environmental Protection Agency, National Emission Standard for Asbestos, 40 *Code of Federal Regulations* Sections 61.140 through 61.156; and the U.S. Environmental Protection Agency (EPA) rule on labeling requirements and phased banning of asbestos products (Sections 763.160-179).

There are currently in use and under development a number of substitute materials to replace asbestos in certain applications. Manufacturers and users are encouraged to develop and use effective substitute materials that can meet the specifications for, and operating requirements of, the equipment to which they would apply.

SAFETY AND HEALTH INFORMATION WITH RESPECT TO PARTICULAR PRODUCTS OR MATERIALS CAN BE OBTAINED FROM THE EMPLOYER, THE MANUFACTURER OR SUPPLIER OF THAT PRODUCT OR MATERIAL, OR THE MATERIAL SAFETY DATA SHEET.

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Planning and Conducting Surface Preparation and Coating Operations for Oil and Natural Gas Drilling and Production Facilities in a Marine Environment

1 Scope

Worldwide, marine exploration, production, development and decommissioning operations are conducted from a variety of structures (installations, as defined herein). These installations must be inspected periodically and maintained in order to assure structural integrity and minimize pollution risks. Maintenance of an offshore structure, regardless of its classification, necessarily includes blasting and coating activities. The purpose of this publication is to establish practices and procedures that should be followed to minimize the discharge of spent blast abrasive, and paint overspray to the surrounding waters during these activities, to meet the spirit of MARPOL Annex V. Additionally, any maintenance waste which is captured must be properly packaged and shipped to shore for disposal. This publication also addresses procedures to contain and capture maintenance waste, including, but not limited to, spent blast abrasive and associated materials, during such maintenance activities on marine structures. The safety of personnel is the most important consideration for all work activities. Consequently, any blasting and coating work conducted shall consider the safety of personnel as paramount. Other types of discharges that may be permitted by various regulatory authorities, are outside the scope of this document. These would include (1) discharges in compliance with a relevant governmental permit (e.g., the applicable provisions of the U.S. Clean Water Act or the applicable sections of European Community [EC] Dangerous Substances Directives), (2) discharges resulting from circumstances identified and reviewed and made part of the public record with respect to a permit issued or modified and subject to a condition in such permit, and (3) continuous or anticipated intermittent discharges from a point source, identified in a permit or permit application which are caused by events occurring within the scope of relevant operating or treatment systems.

Additionally, containment issues for operations below the water line are outside the scope of this document.

1.1 DEFINITIONS

The following definitions are provided to help clarify and explain the use of certain terms in this publication. Users should recognize that certain terms utilized in this publication may have a different meaning than in other API publications.

1.1.1 abrasive blasting: The operation of cleaning or preparing a surface by forcibly propelling a stream of abrasive material against the surface.

1.1.2 barrier: Items so placed as to prevent movement of personnel or material from one area to another.

1.1.3 coating operations: The operation of placing or replacing the coating, which is generally paint, on a surface that has been appropriately cleaned.

1.1.4 containment system: The cover panels, screens, tarps, scaffolds, plywood, supports, and shrouds used to enclose a work area or coating removal tool. The purpose is to minimize or prevent the abrasive coating preparation materials generated during surface preparation from entering into the environment, and to facilitate the controlled collection of the abrasive materials, as applicable, for recycling or disposal.

1.1.5 contractor: Any person or company that contracts or subcontracts to provide services to the owner/operator.

1.1.6 discharge: For the purpose of this document, a discharge is any spilling, leaking, pumping, pouring, emitting, emptying, or dumping of spent blast abrasive, paint overspray, or other materials associated with surface preparation and coating operations.

1.1.7 installation: For the purpose of this publication, a vessel or structure of any type, operating in the marine environment, including any facility, vessel, rig, platform, or other vehicle or structure, domestic or foreign, such as fixed and floating facilities and MODUs, used for offshore minerals exploration, production, development and decommissioning operations.

1.1.8 maintenance waste: Materials collected while maintaining and operating the installation, including, but not limited to, soot, machinery deposits, scraped paint, deck sweepings, wiping wastes, and rags.

1.1.9 MARPOL 73/78: The International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating to that Convention.

1.1.10 Maximum Extent Practicable (MEP): For the purpose of this publication, the MEP is a level of implementing appropriate practices in order to achieve a reasonable performance standard in preventing the discharge of waste from surface preparation and coating operations. MEP must place human safety as a paramount concern in conducting these operations, while taking into account environmental protection, available technology, cost effectiveness, site specific issues, and other essential issues. MEP allows appropriate flexibility to meet the performance standard.

1.1.11 minimize: Means to reduce to the minimum practicable amount while placing human safety at the highest priority and taking into account the efficiency of the practice employed.

1.1.12 MODU: Mobile Offshore Drilling Unit.

1.1.13 MSDS: Material Safety Data Sheet.

1.1.14 on site: The same or geographically contiguous property (generally, the installation as defined herein).

1.1.15 operator: The individual, partnership, firm, or corporation having control or management of operations on the leased/licensed area or a portion thereof, on which the installation is located. The operator may be a lessee, designated agent of the lessee(s), or holder of operating rights under an approved operating agreement.

1.1.16 owner: Any individual, association, partnership, consortium, joint venture, private, public, or municipal firm or corporation, or a government entity holding title to or, in the absence of title, other documentation of ownership of the installation as defined herein; however, this does not include a person who holds documentation of ownership primarily to protect a security interest and does not participate in the management or operation of the installation as defined herein.

1.1.17 personnel: Management, supervisors, or employees, or third party contractor workers, hired by the owner/operator and engaged in activity subject to this publication. Personnel can refer to either owner/operator employees or to those individuals employed or retained by a third party contractor to perform work activities covered under this publication.

1.1.18 prevent: Means to eliminate discharges to the maximum extent technically and economically practicable while placing human safety as the essential priority.

1.1.19 PRPE: Personal Respiratory Protective Equipment.

1.1.20 psi: pounds per square inch.

1.1.21 shroud: A device that is designed to enclose or surround the blasting activity to minimize, to MEP, the atmospheric dispersion of fine particulates and direct that material to a confined area.

1.1.22 spent blast abrasive: Blast abrasive that has been used and as the result of that use is no longer useful for its intended purpose.

1.1.23 surface preparation: Appropriate cleaning of a surface prior to coating. Such operations include, but are not limited to, abrasive blasting, water blasting, grinding and needle gunning.

1.1.24 water blasting: The operation of cleaning or preparing a surface by using high-pressure liquid for surface preparation.

2 Waste Minimization Practices

In order to minimize the amount of excess material remaining after completion of the abrasive blasting or coating, only the anticipated amount of supplies needed for a project should be obtained and held on location. Following manufacturer recommendations for preparation of the surface to be coated and for the application of the coating will assure that waste generated as the result of such operations will be minimized.

3 Contractual Obligations

This publication recognizes that owners, operators, contractors and their personnel may have specific contractual responsibilities which may vary from the procedures in this document. The procedures in this publication should be used as guidelines for marine oil and gas operations in order to assure that discharges occurring during abrasive blasting and coating operations are minimized. It is not the intent of this document to alter contractual relationships between parties.

4 General

The following is a list of general practices that should be followed during abrasive blasting or coating operations:

- 4.1 *Blast Abrasive Material Selection***—Blast abrasive materials should be selected on the basis of the coating manufacturer's recommendations application for which the blast abrasives will be used.
- 4.2 *Wind Speed Limitations and Adverse Weather Conditions***—Abrasive blasting should not be conducted when wind speeds and adverse weather conditions render containment systems ineffective.
- 4.3 *Selection of Blasting Technique***—Coating manufacturer's recommendations should be considered when deciding between the use of abrasive blasting and water blasting and the selection of blast abrasive.
- 4.4 *Blasting Frequency***—Blasting and coating operations should be conducted as identified in the owner/operator maintenance program or during periodic or annual surveys that are performed.
- 4.5 *Pressure Regulation***—Manufacturer's specifications should be followed to determine the optimum pressure when applying coatings. These guides should be used in order to maximize the application efficiency, thus reducing discharges.
- 4.6 *Coating Selection***—Coating selection should be considered as a method to minimize discharges. Coatings are continually being upgraded to allow for extended life. Selection of a coating with an extended life minimizes the frequency of coating application, thus reducing discharges.
- 4.7 *Coating Applications***—Manufacturer's recommendations for the number of coats to be applied should be followed. Additional layers of coatings do not necessarily increase the duration between reapplying the coating, but will increase the discharges associated with application of the coating.
- 4.8 *Disposal of Spent Coating Supplies***—As the result of the coating operations, used material will be generated, such as brushes, buckets, protective clothing, protective masks, etc. This used material should be handled correctly, stored properly and disposal should be conducted in accordance with established regulations.
- 4.9 *Weather Conditions***—Careful attention shall be paid to weather condition if the work area is subject to rain or wind. If heavy rains or high winds are in the forecast, the owner/operator should make the final decision as to whether weather conditions pose a threat to the safety of personnel or containment practices or coating application.
- 4.10 *External Containment***—External containment should be used where safe and practicable to confine discharges due to abrasive blasting. The containment system should be placed as close as practicable to the immediate blast area to minimize the area of impact. As appropriate, exits should be clearly marked and readily identifiable. The specified containment or control technique should be established prior to commencement of abrasive blasting operations to assure containment to the MEP. Acceptable containment can be made of, but are not limited to tarps, scaffolding and plywood. As appropriate, place covering worksite floor, as applicable and feasible. Grates should be covered. Deck drains should use filters or plugs to prevent abrasives and other materials from entering the drain system and sump.
- 4.11 *Proper Ventilation and Safety***—Proper ventilation of an area blasting or coating operations are being conducted will assist in maximizing worker safety and health. Air hoses shall be equipped with pressure regulators, water traps, and safety clips.
- 4.12 *Operations***—At least once each hour while operations are ongoing, the work area should be monitored and a check made that containment is being accomplished and repair or adjustments to barriers made as needed. In the event that a containment failure occurs, operations are to cease immediately, necessary repairs made to the containment, and the supervisor notified. Tools should be maintained regularly as suggested by the manufacturer.

5 Preparatory Considerations

5.1 PERMITS REQUIRED

5.1.1 *Work Permits*—As appropriate and in accordance with the procedures established by individual owner/operators, work permits or authorization should be secured. These work permits should specify the timing and duration of the work and any special conditions associated with the work such as lock out/tag out, confined space, and similar conditions.

These work permits should be obtained prior to the initiation of each project. Containment and capture of discharges should be included in the conditions of the work permit, if utilized.

5.2 SAFETY PRACTICES

5.2.1 Safety Program—The owner/operator specific safety requirements should be followed for all operations conducted in accordance with this publication. All contractors should be made aware and must comply with the safety program established by the owner/operator.

5.2.2 Job Preparation—Pre-job safety meetings that include all affected personnel, including contractors, should be held to review responsibilities of the operation(s) to be performed. Such meetings should address the communication aspects of the job, including shift changes and language issues, if English is not the understood language of the involved personnel.

5.2.3 Proper Ventilation—Proper ventilation of an area where blast abrasives or coatings are being utilized or applied will assist in minimizing the potential for worker exposure or overspray.

5.2.4 Marked Exits—When conducting abrasive blasting or coating activities, accesses to stairs or emergency exits should be clearly marked and a clear pathway to the exit routes should be maintained. The use of highly visible exit signs or special tarps with exit signs is highly recommended. Additionally, warning signs should be posted or barrier tape utilized during blasting/coating operations to advise blasting/coating personnel and others of these operations.

5.2.5 Safety Practices for Coating Systems—Properly used and maintained spray guns and shrouding will greatly minimize coating overspray concentrations, but will not completely eliminate overspray from the air personnel breathe. Personal Respiratory Protective Equipment (PRPE) is recommended as is a Respiratory Protection Program.

5.2.6 Safety Practices for Abrasive Blasting—Engineering, administrative, and housekeeping controls, as applicable, should be in place to limit exposure of personnel and discharges. Engineering controls consist of appropriate design elements to minimize discharges. Administrative controls, such as limiting a worker's time in areas where blast abrasives are being utilized should be considered. Good housekeeping techniques are important and should include techniques such as routine clean-up and removal of the spent blast abrasive.

5.2.7 Duty to Report—Unsafe and potentially dangerous conditions should be eliminated immediately, if possible. If immediate corrective action is not possible, the operations should cease until the unsafe condition has been mitigated. The unsafe condition should be reported to the supervisor in charge.

6 Guidelines for Abrasive Blasting

6.1 OVERVIEW

Abrasive blasting is used for cleaning surfaces such as steel, usually to remove scale, rust, old paint or other material before applying a protective coating. It involves using a stream of abrasive material, propelled at high speed by compressed air or water to clean, abrade, etch, or otherwise change the original appearance or condition of the surface.

Spent blast abrasive will contain the residue of the substrate cleaned, including the coating removed, if any. In some instances, the spent blast abrasive may be considered a regulated hazardous waste by the relevant regulatory agency or coastal state with jurisdiction, and should be evaluated and/or tested to determine its regulatory status. Appropriate training and maintenance programs will help assure that equipment operates safely and properly and waste is minimized.

Spent blast abrasives generated during this process will be collected to the MEP on pads, trays, skids, decking or other surfaces within the containment area and will be collected and packaged for shipping and off site disposal.

Blast abrasive is procured according to known and documented specifications. It should be selected on the basis of personnel health and safety aspects, environmental concerns, regulatory requirements and cutting ability. In general, abrasive blasting includes using compressed air to propel blast abrasive through a nozzle for the purpose of removal of coating, rust, etc. The spent blast abrasive should be contained and collected to the MEP, then either disposed or reused, dependent on the type of blast abrasive. Spent abrasives that are not able to be contained may result in a discharge to the environment.

6.2 RECOMMENDATIONS AND OPERATIONAL CONTROLS

6.2.1 Types of Blast Abrasive

There are many types of blast abrasive. The specific need should be evaluated when selecting the type of blast abrasive to use. Sand is the most commonly used blast abrasive and is readily available in many particle size grades to suit various job needs. It

may be prewashed to reduce the amount of fine particles. Other alternatives include slag, minerals, metallics or others such as glass. The type of product to be used should be evaluated on a case-by-case basis to determine personnel safety and whether it can achieve the required performance standards.

For each blast abrasive used, a MSDS should be obtained and reviewed to determine the potential risk to human health and the environment as well as the recommended PRPE requirements and disposal options for the spent blast abrasive.

6.2.2 Unused Blast Abrasive

Unused blast abrasive should be dispensed, or transferred, from the product containers in a contained area. The transfer process should be conducted in such a manner to minimize spillage and dust discharges to the MEP. Any spillage should be recovered for reuse or disposed as appropriate.

6.2.3 Control and Containment of Spent Blast Abrasives

Abrasive blasting control measures should consist of operational control(s), containment system(s) or a combination of these techniques in order to prevent discharges from the work area to the MEP.

6.2.3.1 Sealed Joints—The walls, ceiling, and flooring of the containment system should have overlapping seams to minimize escape of spent blast abrasive to the MEP.

6.2.3.2 Routine Inspection/Replacement of Air Nozzles—Air nozzles should be maintained in proper operational condition in order to maintain optimum flow rates and air pressure levels during abrasive blasting. A properly functioning air nozzle will minimize discharges of spent blast abrasive.

6.2.3.3 Housekeeping—Maintain a clean working area in order to help assure that excessive spent blast abrasive is not accumulated. The spent blast abrasive should be collected on a regular basis and not left to accumulate over the course of a job.

6.2.3.4 Washed Blast Abrasive—As appropriate, blast abrasive should be washed a minimum two times to minimize the amount of fine particles in the blast abrasive.

6.2.3.5 Self Contained Abrasive Blaster—The use of a self contained abrasive blasting unit that recirculates the blast abrasive may be of benefit for use on large flat surfaces. This technique, which has limited application, reuses the blast abrasive thus minimizing the potential for discharge.

6.2.4 Packaging of Spent Blast Abrasive—Once collected, the spent blast abrasive should be stored in a container appropriate to the type of spent blast abrasive. Storage containers should be clearly marked with the owner's name.

6.2.5 Storage of Spent Blast Abrasive—Spent blast abrasive should be stored in contained areas designated for storage. Periodic inspections of the storage area where the spent blast abrasive is stored should be conducted in order to assure that the spent blast abrasive is properly controlled/contained.

6.2.6 Disposal of Spent Blast Abrasive—Spent blast abrasive must be transported off-site for disposal in accordance with applicable regulations. Any spillage during transportation of the spent blast abrasive destined for disposal should be managed in accordance with owner/operator specific waste management procedures and applicable regulatory requirements.

7 Guidelines for Water Blasting

7.1 OVERVIEW

Water blasting at high pressure without abrasive materials may also be an alternative method to abrasive blasting for surface preparation. This publication provides recommendations for the use of water blasting to achieve various degrees of surface cleanliness. Water Blasting techniques utilized include water blasting operating at blast pressures ranging up to 15,000 psi, and ultra high-pressure water blasting with blast pressures greater than 15,000 psi.

7.2 RECOMMENDATIONS AND OPERATIONAL CONTROLS

Water blasting control measures should consist of operational controls, or containment or a combination of these techniques in order to minimize discharges from the work area to the MEP.

7.2.1 Routine Inspection/Replacement of Water Blasting Nozzles—Water blasting nozzles should be maintained in proper operational condition in order to maintain optimum water pressure/flow levels during blasting.

7.2.2 Operational Controls—Operational controls include periodic checks of the pumps, operating blast nozzles at the manufacturer's suggested pressure, etc. Proper operation of water blasting equipment can minimize the amount of blasting water being used, thus reducing the amount of water collected as a result of the blasting.

7.2.3 Plugs/Filters for Drain Systems—Plugs/filters should be used to isolate or protect drainage lines to help assure blasting water is not introduced to the wastewater treatment system unless the system is appropriately designed to handle such water.

7.2.4 Housekeeping—Any blasting water collected in a containment area should be removed in as timely manner as practicable in order to minimize the possibility of overfilling of the containment system.

8 Guidelines for Mechanical Preparation

8.1 OVERVIEW

Needle gunning and other similar mechanical means are other methods used for cleaning surfaces such as steel, usually to remove scale, rust, old paint or other material before applying a protective coating.

The residue will contain the coating removed (paint chips), if any. Appropriate training and maintenance programs will help assure that equipment operates safely and properly and waste is minimized. Residue generated during this process will be collected to the MEP on pads, trays, skids, decking or other surfaces within the containment area and will be collected and packaged for shipping and off site disposal.

8.2 RECOMMENDATIONS AND OPERATIONAL CONTROLS

8.2.1 When conducting needle gunning, or other such activities, accesses to stairs or emergency exits should be clearly marked and a clear pathway to the exit routes should be maintained. The use of highly visible exit signs or special tarps with exit signs is highly recommended. Additionally, warning signs should be posted or barrier tape utilized during such operations to advise involved personnel and others of these operations.

9 Housekeeping and Work Completion

Clean up of paint chips should be done at a minimum of once per tour. Paint chips are to be swept up and placed in appropriate containers for proper disposal in accordance with the owner/operator's requirements and applicable regulations. Equipment should be cleaned and placed in the designated storage area after use. Containment barriers shall only be removed once the paint chips are collected and there is no potential for loss. Clean, inspect, return and secure any PPE used, and repair/replace any that is worn out or damaged. Close out the open Work Permits or JSAs as applicable.

Three types of wastes from coating operations are generated. These include coating residues, coating overspray and coating supplies that can no longer be used. This publication only addresses paint residues and the paint overspray. The supplies utilized during the coating process that must be disposed, should be handled in accordance with owner/operator specific waste management procedures and applicable regulatory requirements.

9.1 Coating Residues—Coating residues that are mixed with spent blast abrasives should be contained or controlled.

9.2 Overspray—Paint overspray is defined as the material emitted by the spray guns that does not adhere to the surface of the material being coated and results in minor quantities of discharges. Effective control of discharges of paint overspray requires the proper selection and operation of spray painting equipment and/or barriers and containment systems to minimize overspray.

9.3 Coating Supplies—Typical supplies that must be disposed of properly when spent include such items as brushes, protective clothing, masks, empty cans, solvents, rags, etc. These items should be collected in a storage area for appropriate disposal. Coatings and coating supplies should be selected based on documented performance history, surveys and manufacturer's literature.

9.4 Application Method—Coatings should be applied using the manufacturer's recommendations.

9.5 Types of Coatings—The type of coating utilized should be selected based upon the intended use.

9.6 Discharge Reduction Options—Coating control measures may consist of operational controls, containment systems, or a combination of these techniques that minimizes discharges from the work area to the MEP. External containment should be used

where safe and practicable to confine discharges. The containment system, if utilized, should be placed as close as practicable to the area to be coated to minimize the area of impact. Potential external containment systems may include items such as tarps or sheeting to the MEP.

10 Zone Descriptions and Containment/Control Options

For purposes of this document, the techniques utilized to contain or control discharges associated with the coating or blasting processes are in relation to the exterior areas of the installations in the three zones as described below and generally following demarcation examples in Figures 1, 2, 3 and 4.

10.1 Zone 3—See Figures 1, 2, 3 and 4 for demarcation of Zone 3 for the appropriate installation type. It is paramount that consideration be given to ensuring personnel safety when determining potential control practices and containment options for Zone 3 structures with limited safe access such as heliports, crane, booms, towers, overhangs, etc. Weather conditions are also a factor that should be considered. The following operational controls should be used to the MEP in this zone to minimize the amount of discharges from the blasting and coating operations:

- equipment operational controls
- cessation of operations during adverse weather conditions
- pressure regulation
- proper coating selection to decrease frequency of coating
- proper coating selection to minimize overspray
- application of the optimum number of coats
- blast abrasive washing

In addition to the operational controls utilized in Zone 3, containment options should be used to the MEP. These options include techniques such as:

- external containment
- sealed seams at joints for external containment
- housekeeping
- regularly cleaning containment pads, trays, skids, decking or other surfaces
- self contained abrasive blaster use where appropriate
- plugs or filters for drains
- timely removal of spent abrasives, removed materials or water
- routinely inspect/replace blasting nozzles

These operational controls are discussed in more detail in Sections 6, 7 and 8 of this document.

10.2 Zone 2—See to Figures 1, 2, 3 and 4 for example demarcations of Zone 2 for the appropriate installation type. Zone 2 will generally encompass the area below Zone 3 extending to the water line. It is paramount that consideration be given to ensuring personnel safety when determining potential control practices and containment options. Weather conditions are also a factor that should be considered when formulating a mitigation strategy.

The following operational controls used to the MEP should be considered to minimize the amount of discharges from the blasting and coating operations:

- equipment operational controls
- collection of maintenance waste to the MEP
- cessation of operations during adverse weather conditions
- pressure level regulation
- proper coating selection to decrease frequency of coating
- proper coating selection to minimize overspray
- application of the optimum number of coatings
- blast abrasive washing

In addition to the operational controls utilized in Zone 2, containment options should be considered such as:

- housekeeping
- regularly cleaning containment pads, trays, skids, decking or other surfaces

- self contained abrasive blaster use where appropriate
- routinely inspect/replace blasting nozzles

These operational controls are discussed in more detail in Sections 6, 7 and 8 of this document.

10.3 *Zone 1*—See Figures 1, 2, 3 and 4 for example demarcations of Zone 1 for the appropriate installation type. Zone 1 will generally encompass the area below the waterline. This publication does not address surface preparation and coating applications in Zone 1.

APPENDIX A—REFERENCED DOCUMENTS

The following documents are referenced in this publication as informative references. It should be recognized that portions of some of these are not applicable to the marine environment.

1. API RP 54 *Occupational Safety for Oil and Gas Well Drilling and Servicing Operations*, Latest Edition.
2. API RP 74 *Occupational Safety for Onshore Oil and Gas Production Operations*, Latest Edition.
3. MARPOL Annex V Regulations (33 *CFR* 151, Subpart A).

APPENDIX B—ZONES OF OFFSHORE FACILITIES

1. Zones of a Platform
2. Zones of a Jackup Drilling Rig
3. Zones of a Semi-submersible Drilling Rig
4. Zones of a Drillship
5. Zones of a FPSO
6. Zones of a SPAR
7. Zones of a TLP

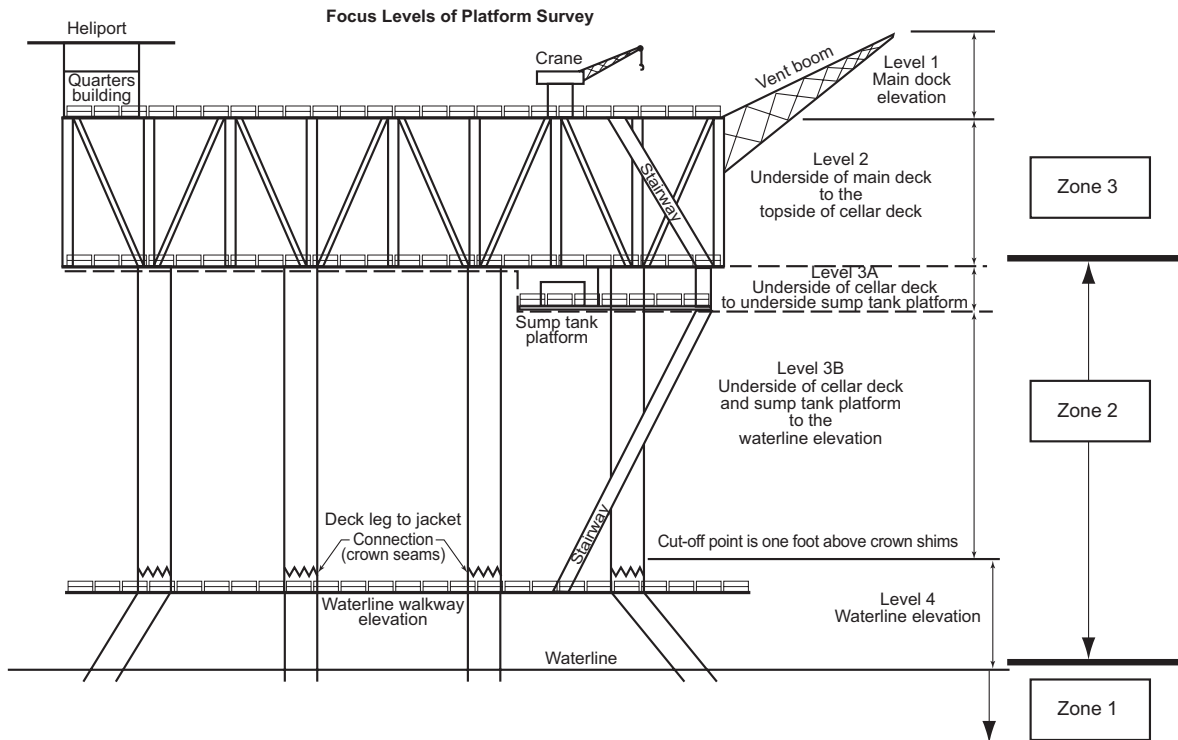


Figure 1—Zones of a Platform

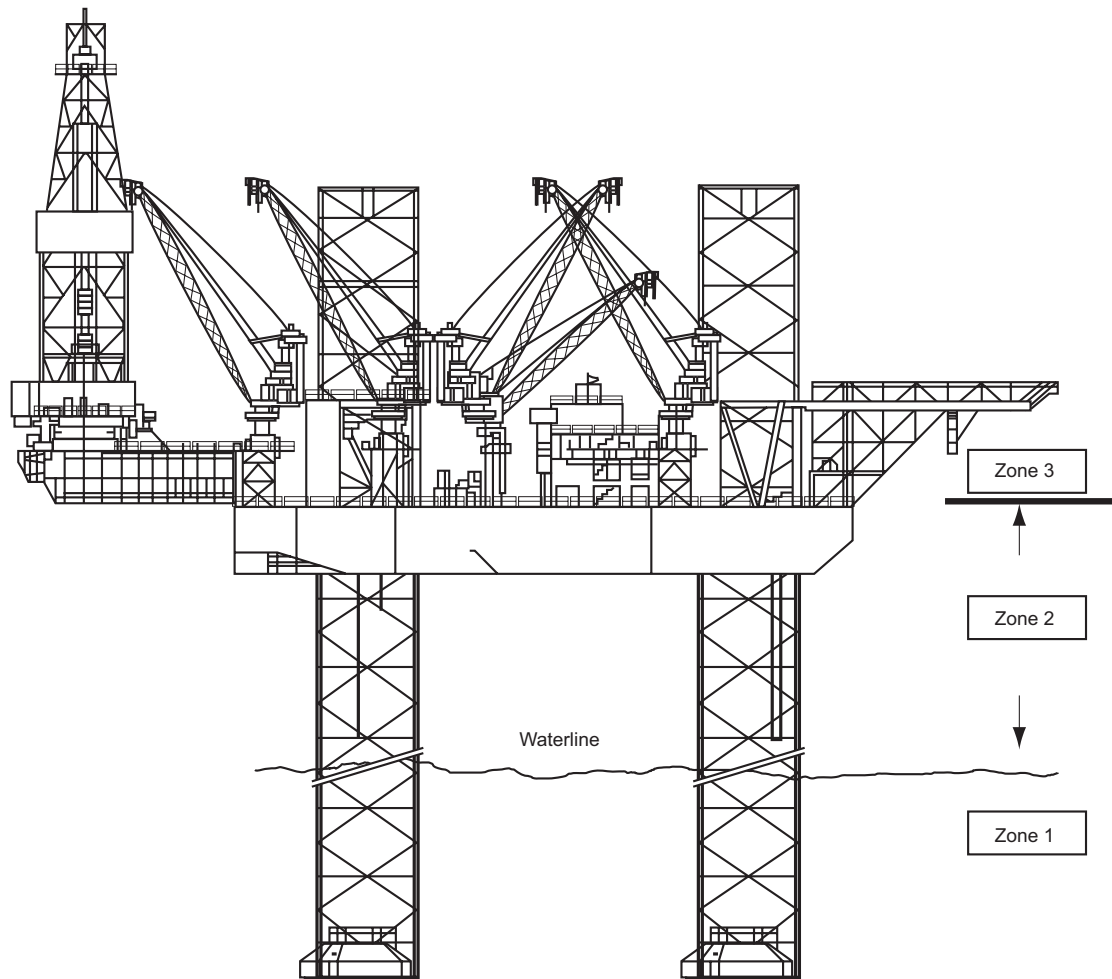


Figure 2—Zones of a Jackup Drilling Rig

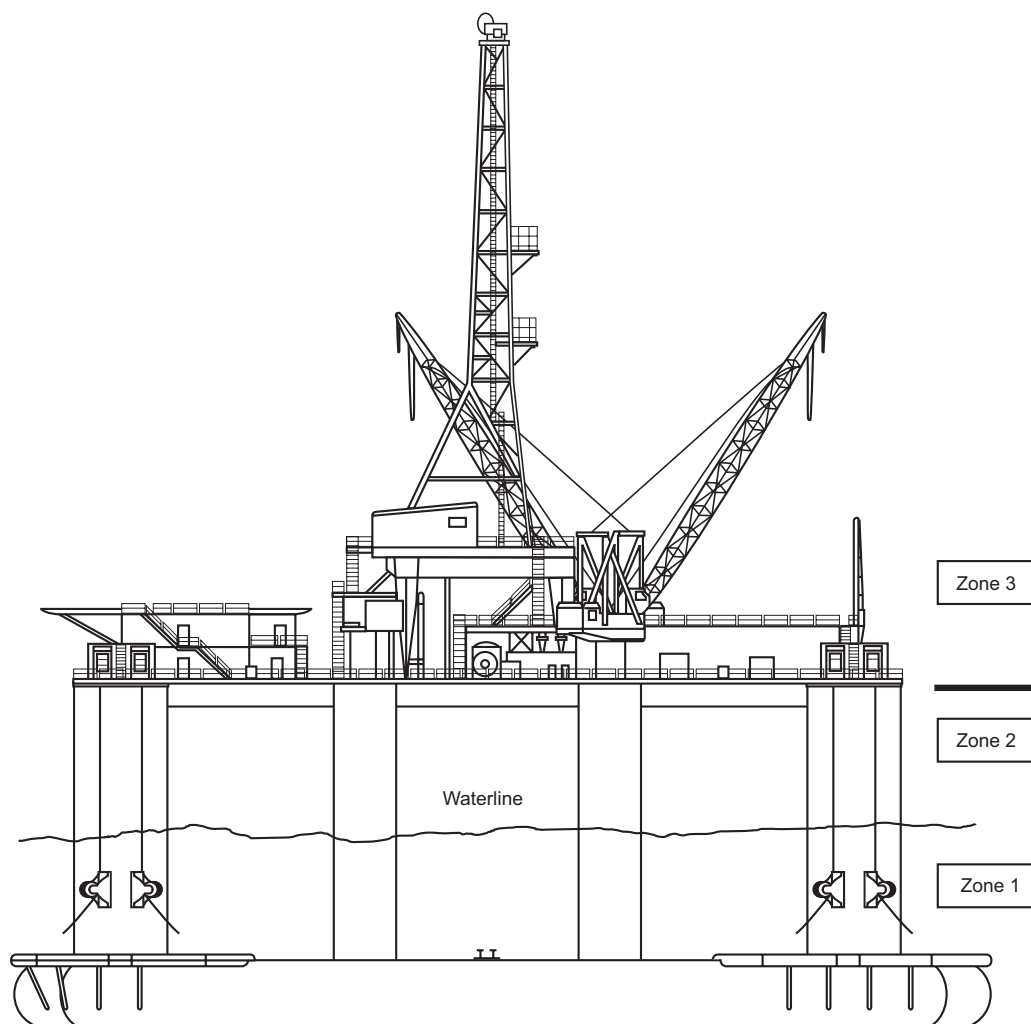


Figure 3—Zones of a Semi-submersible Drilling Rig

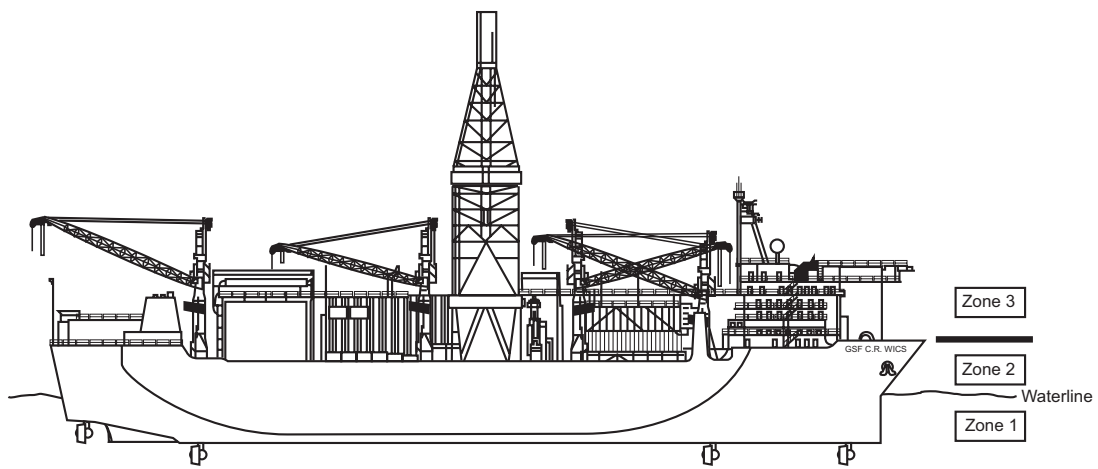


Figure 4—Zones of a Drill Ship

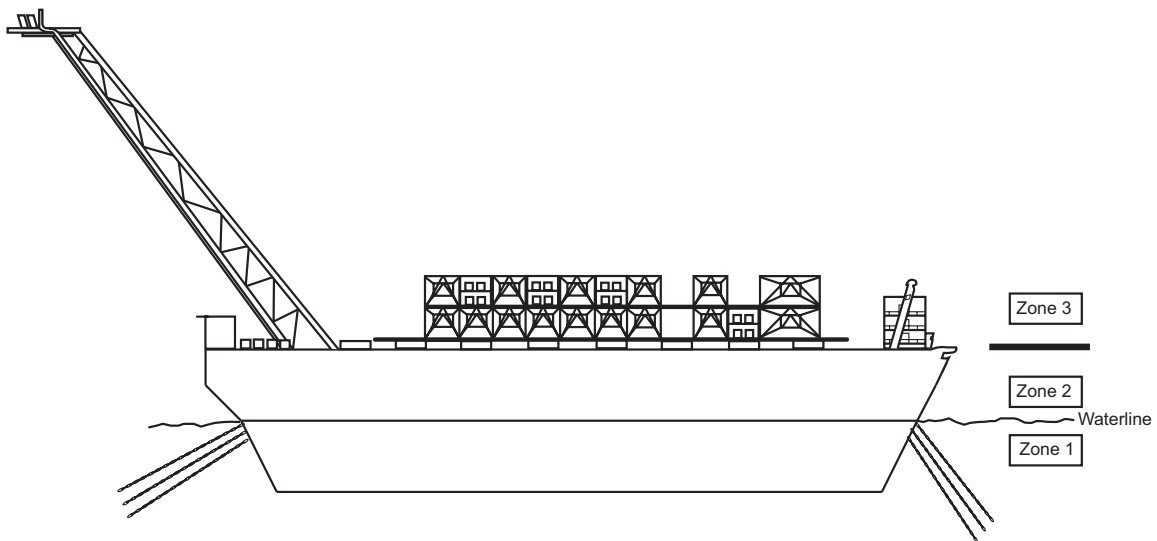


Figure 5—Zones of a FPSO

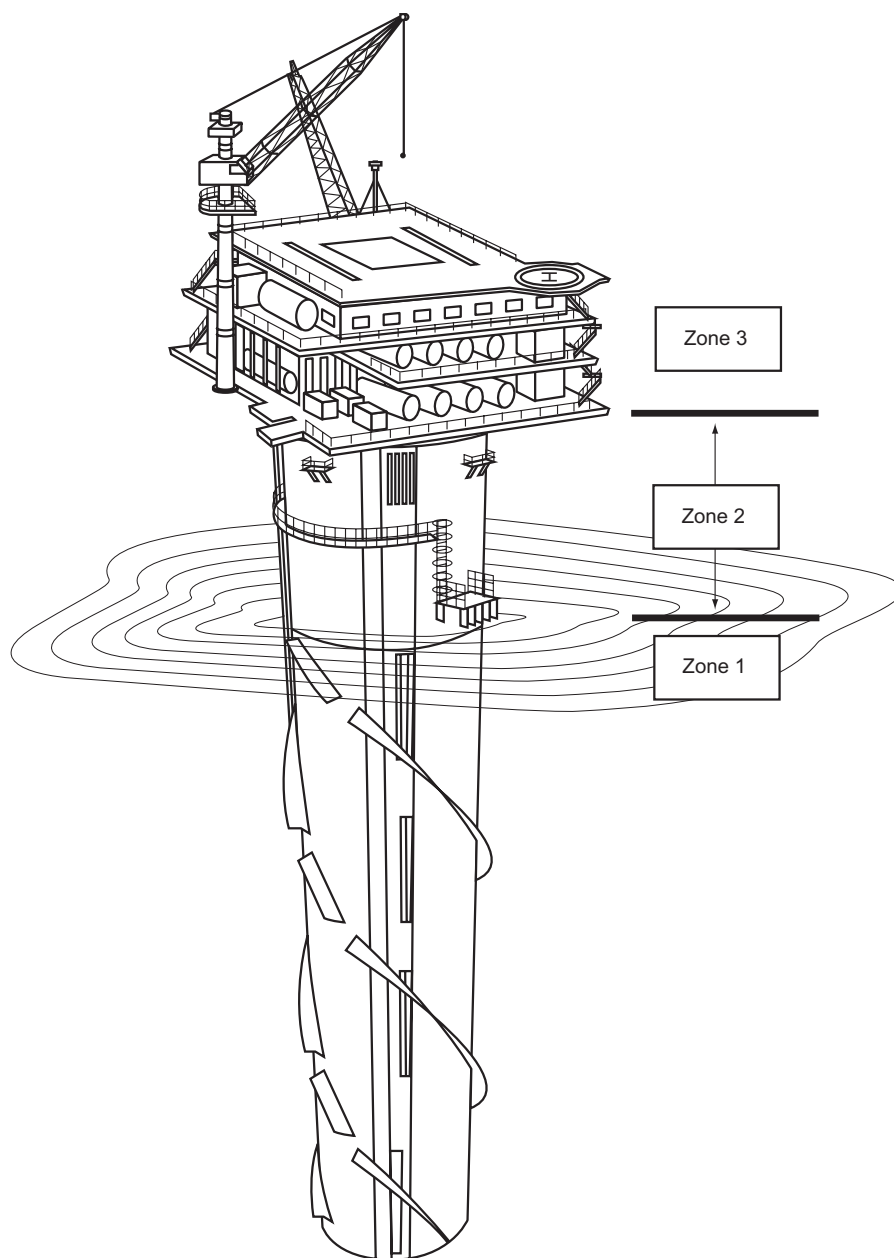


Figure 6—Zones of a SPAR

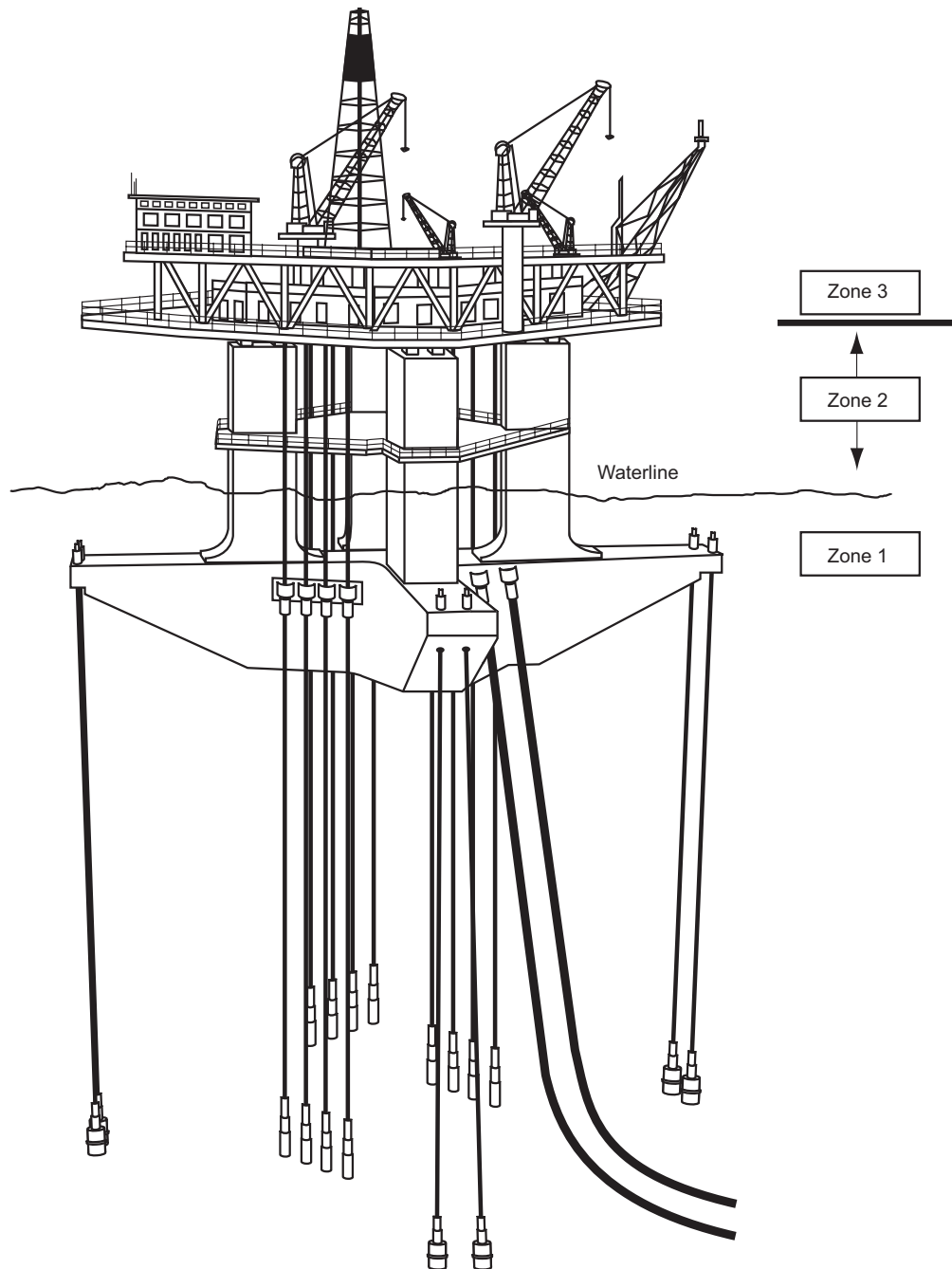


Figure 7—Zones of a TLP



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